SCIENCE

NEW YORK, SEPTEMBER 16, 1892.

DANGER FROM THE POPULAR MISUSE OF QUININE.

BY W. THORNTON PARKER, M.D

A RECENT editorial in the *Medical News* of April 2, 1892, concerning deaths from cocaine, may well be noticed in connection with the investigation of dangers from the popular misuse of quinine. "I have never seen it," *ergo* "No man's experience, however wide, can cover all the possibilities of disease and accident. It may be well and wise for one to say, 'I have not seen it,' when the possibility or likelihood of this or that pathologic or toxic accident is under discussion; but it is never wise and never well because of the perhaps limitation of one's own experience to deny the reality of occurrences vouched for by competent observers, and not in themselves incredible."

A recent item in one of the daily journals has prompted me to say a word against the misuse of the popular remedy known as quinine. The item referred to states that a sea-captain, sailing his craft too near a sunken ledge, was warned to give the dangerous quarter a wide berth. He replied, by yelling out at his adviser, "You go straight to hell; I am sailing this craft where I —— please." The vessel was wrecked, and the insurance money refused on the ground that the captain wilfully destroyed his vessel. This the defence emphatically denied. In explanation of his extraordinary language, the captain stated that he had been suffering from malaria, and had taken large doses of quinine for relief, and had become so much "influenced" by its action that really he did not know what he was saying or doing.

Few, if any medicines, enter so largely and generally into popular use as quinine. Throughout the world we find it almost everywhere for sale; it can be purchased in any quantity by anybody, and used as the purchaser may think best, in larger or smaller doses, at intervals, or continually. Few seem to understand its poisonous action, or even suspect that its continual use can result in any special injury to the system. It is prescribed by all sorts and conditions of men, women, and children. Ruse, in his excellent text-book of medical jurisprudence, defines a poison as "a substance which, when introduced into the body by swallowing or by any other method, occasions disease or death; and this as an ordinary result in a state of health, and not by a mechanical action. It must be as an ordinary result; a substance, for example, which affects one person injuriously through idiosyncrasy, is not to be called poison. Again it must be *in the healthy system*, as is well known, many diseases render the system extremely susceptible to impressions by external agents, e. g., in gastritis, the blandest substance, even water, may excite vomiting."

The action of the malarial poison upon the system is of such a nature that many would claim that any abnormal nervous impression would be more likely to have its origin in the malarial poison than in the quinine, which is given with a view to neutralizing that poison. We know of so many diseases following the inception of the malarial germs that any attack upon quinine, as a poisonous remedy, may reasonably expect prompt resentment. Ringer states, that "large doses produce severe frontal headache with dull, heavy, tensive, and sometimes agonizing pains. While these symptoms last, and, indeed, generally before they appear, the face is flushed, the eyes suffused, and the expression is dull and stupid. Even small doses in persons very susceptible to the action of this medicine will produce some of the foregoing symptoms, especially the headache and mental disturbance. Many of these symptoms are, no doubt, due to the action of quinia on the brain. In toxic doses it excites convulsions. Chirone and Curo find that the removal of the motor centres of the brain prevents these convulsions; and, if the central hemisphere is removed on one side, the convulsions are unilateral. Albertoni, on the other hand, finds that quinia will induce convulsions when the central hemisphere or the cortical motor centres are removed." Dr. Bartholow states, that "In full medicinal doses, as the quinia accumulates in the brain, a sense of fullness in the head, constriction of the forehead, *tinnitus aurium*, more or less giddiness, even decided vertigo, may be produced. In actually toxic doses all of the above symptoms have been intensified. There are intense headache with constriction of the forehead, dimness of vision, or complete blindness, deafness, delirium, or coma, dilated pupils, weak, fluttering pulse, irregular and shallow respiration, convulsions, and finally collapse and death." Dr. Wood states, that "The minimum fatal dose of quinine is not known, but it must be large, and probably varies very much." Brown-Sequard states, that "In epileptics the attacks are rendered decidedly more frequent by the cinchona alkaloids." Dr. Wood is of the opinion, also, that "In large doses quinia, without doubt, abolishes the functions of the cerebrum."

From the foregoing we have evidence to demonstrate that quinia is too dangerous a remedy to be prescribed recklessly by medical men, and that its popular use by people ignorant of its action should be condemned and, if possible, prevented. In our own practice we have known of four cases where moderate doses continued even for two or three days would produce serious cerebral disturbance amounting to almost homicidal mania. There are very many cases in every community where the use of quinine will affect the nervous system of patients in a serious manner. One patient, after using ten grains, did not know whether it was morning or evening, and was bewildered in finding his way home. Another complained to me that he could not take quinine without feeling cross and out of sorts for a week afterwards. Still another, a very peaceful man naturally, stated that the use of quinine for a day or so made him quarrelsome and pugilistic, and he feared that under its influence he might commit some act which might bring him into serious trouble. Supposing that a lawyer should offer in defence of his client the statement that, acting under the advice of his physician, the patient had been taking large doses of quinine for several days, and in a paroxysm of rage, while under the influence of the drug, he had committed homicide, would this man in equity be responsible for his deed? That quinine is a dangerous drug with many there can be no doubt, that it is universally dangerous there may be some question. It seems to me but just, under the circumstances, that it should be rated as a poison. The study of the action of quinine, from a medico-legal standpoint, is one, therefore, not without interest.

POPULAR ERRORS ABOUT WILD ANIMALS.

BY THEODORE B. COMSTOCK.

IN the issue of the *Popular Science Monthly* for September, 1892, at page 719, is the following item under "Notes": —

"A novel view of the puma, or panther, as it is commonly called, is taken by Mr. W. H. Hudson, in his 'Naturalist in La Plata,' who insists that it never attacks men except in self-defence. In the pampas, where it is common, the *gaucho* confidently sleeps on the ground, although he knows that pumas are close by; and it is said that a child may sleep on the plain unprotected in equal security."

There are many popular notions concerning the danger from wild animals which everyone who has travelled out of the beaten

paths has come to know as groundless. The puma, or American panther, and its South American representative, the jaguar, are not regarded by experienced hunters and naturalists as animals to be feared, excepting under circumstances which leave no avenue of escape open to the beast. The writer has repeatedly observed this fact in connection with the puma in this country, with the jaguar in the forests of the Amazon, and with various other wild animals, in both regions, which are terrible antagonists when brought to bay by wounds or other events demanding defence of self or young. The puma plays like a cat about the lonely traveller on foot or snow-shoes in the Rocky Mountains, and the curiosity of the jaguar brings him nightly to the camps of voyagers along the Brazilian rivers. I have often in that region been disturbed in sleep by such prowlers, who would rush suddenly off upon the slightest movement of my body; and upon numerous occasions in the morning fresh tracks in the sand all around our blankets would be visible, many times without our being awakened by the movements of the animals.

Mr. Hudson's remarks regarding the fearlessness of the natives in La Plata do not, however, agree with my own observations of the average Amazonian dwellers. As an instance, one night in 1870, at the Cachociras (waterfalls) de Maroim upon the Tocantins River, some 200 miles above the city of Pará, we encamped in the forest at the edge of the river, contrary to our usual custom of selecting a sandy island. Some in hammocks, others with blankets spread upon the ground, we North-Americans all slept soundly, notwithstanding that a rock cavern with well-gnawed bones and other signs of jaguar occupancy lay within 200 feet of the camp. I did awake once and saw the glaring eyes of a huge jaguar, as I supposed, within a few feet of my hammock. Next morning the tracks were evident in this particular spot, as well as many others all around camp, which were not there when we lay down at night. But the natives! Every mother's son of them uttered that night fervent prayers for protection, and sought rest in the tree-tops, swinging their hammocks from limbs hanging far out over the water, at the same time cautioning us of the great danger to be feared from vicious attacks of the tigers. This is only one of a number of similar instances, and not a little experience with the puma and with bears of various kinds (including the cinnamon and grizzly) and other animais of reputation for unbridled ferocity, has brought me to the same conclusion regarding them. The writer called attention to the harmless nature of some supposed dangerous *feres* as early as 1873–74 in articles in the *American Naturalist* upon "The Scientific Value of the Yellowstone Park."

Venomous reptiles and insects, as the rattlesnake, "Gila Monster," tarantula, scorpion, centipede, etc., have reputations beyond their deserts for blood-thirstiness. Notwithstanding the numerous authentic cases of poisoning by them, I have yet to learn of one which cannot be fairly regarded as the *derrier resort* of the animal in a defensive attitude. Give any one of these creatures a reasonable (to their notion) chance of escape and they will avail themselves of it in preference to attack. One may come upon them suddenly, and unconsciously put them in a position from which no escape is open; but, if they are let alone or given a free field, they will always avail themselves of it. I remember the case of a rattlesnake in Texas, which we had surrounded and which was menaced by clubs upon all sides. He ran for dear life, striving his best to pass the gaps between each pair of enemies, until, baffled at every point, he suddenly turned upon the writer for an attack. As soon, however, as this manœuvre had opened a passage-way in one direction, he darted off and was again caught only with great difficulty. So, in Indian Territory, among the Wichita Mountains, where the rattlesnakes are akin to boas in size and hideousness, they are wofully sluggish. I have encountered them there among the rocks and in the tall grass, with the sickening rattle sounding long enough to get far from harm before the dangerous thrust was made. My horse has almost stepped upon them in such situations in that region, as well as in Wyoming, Texas, Arizona, and elsewhere, without further result than a scampering off of the snake. Much as the boa constrictor is dreaded in Brazil, cases are exceedingly rare of the exercise of its undoubted power over humanity.

The alligator, with all his ability to devour, is an arrant coward, and we often bathed in the tropical rivers where they were disporting themselves not far away. The natives there claim that none but drunken men are in danger from their attacks.

Hunger, endangerment of life, excessive fear of man with no means of escape, and a sudden surprise are all effective in bringing up every means of defence. The real danger from association with many of these creatures is the liability to meet them unawares, or to suddenly place them on the defensive through the unconscious movements of sleep. The more sluggish or the smaller the animal, the greater is this risk.

In Arizona the bite of a certain small species of skunk is very much dreaded, owing to the belief that hydrophobia is a probable result. There is almost no danger from this source, nor from the vile excretions of other species of polecat, if one does not directly attack them; but from their unfortunate sociability in this region, a sleeping person may suddenly throw out his hand when disturbed, without awakening. In nine cases out of ten this will drive off the intruder, who will rarely return. Occasionally, however, such an act may hit the animal, when he will bite as he flees. Very few cases of this kind have been reported. I have frequently discovered innumerable tracks of these animals about my cot of a morning when camping in sandy tracts, and sometimes have seen them moving about. A movement of the arm is always enough to send them post-haste to cover at a distance. Persons lying on blankets on the ground need more caution, as these "essence peddlers" will sometimes occupy such beds on cold nights.

Skunks are extremely abundant for several weeks in autumn in this region. Last year four of them entered the university itself, and at one point in the Baboquivon Mountains as many as thirty were killed near our cabin in two or three days. They would come up to the doors at midday, and as many as seven at one time were seen on moonlight nights within shooting distance.

These pests have again made their appearance this month. There seem to be four kinds of them, varying materially in "scentability" from the inodorous little biter to the one which is the very *quintessence* of malodorousness, and in color from a light gray to a dense black with white tail. Somehow or other, one of each kind inhabited a cosy nook beneath the writer's office last fall. The little gray one was particularly fond of intruding into my bed-room until the shot-gun was called into requisition.

Tucson, Arizona, Sept. 5.

CONCERNING THE AERATION OF MILK.

BY C. S. PLUMB, DIRECTOR AGRICULTURAL EXPERIMENT STATION OF INDIANA.

MUCH advance has been made in our knowledge of dairying of late years, and especially in America has there been much attention devoted to problems affecting the industry, which has resulted in remarkable progress. Some of the American agricultural experiment stations have made themselves best known by the dairy investigations they have conducted.

Among these subjects of study has been that of the influence of aeration upon milk. Milk fresh from the cow, that was aerated and suddenly reduced in temperature at the same time, it was claimed, would remain sweet longer than milk not so treated set under similar conditions. Within a comparatively short time aerating machines have been placed on the market, that are credited with removing disagreeable odors and retarding acidity of milk.

Bulletin 27 of the Vermont Experiment Station, for January, 1892, states that the "aerator gave good satisfaction" when in use at that institution. At the Cornell University Experiment Station the aeration and cooling of milk were studied by Professor H. H. Wing, and the results published in Bulletin 39, for July, 1892. In this it is shown that the Champion aerator will cool 225 to 250 pounds of milk per hour down to about 60° F. Milk passed over the Champion was, on an average, perceptibly sour in fifty hours after setting; that aerated on the Star machine was sour in fifty-one hours; while milk aerated with the Powell machine

soured in forty-six hours, the average length of time in which milk not aerated became acid. It was also shown that skim-milk from aerated milk contained .53 per cent of fat against .31 per cent of fat in skim-milk from milk not aerated; this milk was set in Cooley cans.

During April and May of the present year the writer, assisted by Mr. H. C. Beckman, an agricultural student in Purdue University, carried on a series of tests to note the influence of aeration upon the securing of butter-fat in milk, the details of which were presented to the Society for the Promotion of Agricultural Science, at Rochester, N.Y., on Aug. 20. Fifty pounds of fresh, warm, mixed milk was divided into two lots of twenty-five pounds each. Lot one was passed over an Evans and Heuling aerator and reduced in temperature, on an average, from 88.3° to 56.5° F. This milk was then set in cold water, and skimmed in twenty-four hours. Lot two was treated like lot one, excepting that it was not aerated. Twenty-nine lots of cream were secured from each class, which resulted in a total amount of 183 pounds 5½ ounces of cream from aerated milk, and 181 pounds 10½ ounces from that not aerated. Daily tests were made with the Babcock machine, which showed an average of 24.4 per cent fat in cream from aerated, and 24.0 per cent of fat in cream from non-aerated milk. Thirty-two pounds seven ounces of butter were made from the cream from aerated milk, and six ounces less from the non-aerated.

The limited amount of experimental evidence published would indicate that aerated milk kept sweet somewhat longer than that not so treated, other things being equal. Our practical observations seemed to point this way. In order to more carefully investigate this point, a chemical investigation of the subject was carried on under the direction of Professor H. A. Huston, chemist of the Purdue University Agricultural Experiment Station. The milks were treated as noted above, one lot being aerated and the other not. Check samples from each lot were taken every twelve hours. The relative acidity of the milks was determined by means of the quantity of one-half normal caustic potash required to produce a neutral tint. On account of the well-known amphegenic action of milk with litmus paper, it was considered desirable to obtain results with more than one indicator. After repeated trials with a large number of indicators, phenol-phthalein and coralline were selected. The milk was titrated at once after sampling. After the first twelve hours 5 cubic centimeters one-half normal HCl were added to 250 cubic centimeters of the milk; 25 cubic centimeters of this milk were taken for titration. Several methods of setting the lots of milk were tried. A synopsis of these tests, over equal periods of time, shows the following interesting results: In sixteen tests the aerated milk was most acid; in eleven tests the non-aerated milk was most acid; while in seven cases the acidity was equal in both lots. These tests, which represent considerable painstaking work, do not indicate the results from aeration that were to have been expected as based on current opinion.

If cows are properly fed and milked, the writer does not believe that normal milk will be disagreeable if set in clean vessels in sweet surroundings, yet there are those who lay great stress upon the animal odor in milk, and the necessity of removing it. It is claimed that the aerator will accomplish this. In the *Wisconsin Farmer* of Sept. 3, a short article is published on aerating milk, credited to "a Vermont authority." Says the writer, "by aerating milk, odors can be completely driven out that have been absorbed by the milk after being drawn from the cow. Odors that were derived by the milk through the system of the cow are not so easily taken out. They will be somewhat lessened, but can never be wholly removed. Milk should be aerated as soon as possible after it is drawn, and it should, at the same time, be cooled. Aerating alone is an advantage, but its good effects on the keeping of milk are much increased by bringing the milk down to 55° or lower. Milk should keep at least twelve hours longer for the aerating. By using a cooler and aerator faithfully it is possible to dispense with ice in selling milk under the ordinary conditions as they occur in the smaller cities; but where the milk is to be brought by train, and is 24 to 36 hours old before it is put on the milk cart, it would be necessary to use ice even with aerated milk. . . . The man who is raising his cream by shallow setting or cold deep setting has no use for a milk aerator or a milk cooler. Either would be a positive detriment, occasioning the loss of a large amount of butter in the skim-milk."

This subject is one of considerable interest and importance. A person has no business to have milk so contaminated by odors *after being drawn*, as to require the use of aeration to make it palatable. As bearing on the other points in the article quoted, I believe there is but little experimental evidence at hand, though this in a measure substantiates it. Our experiment stations have an opportunity to do some interesting work in this direction.

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REPORT OF THE SUMMER SCHOOL OF THE BROOKLYN INSTITUTE FOR THE SEASON JUST CLOSED.

BY HERBERT W. CONN, DIRECTOR.

THE Biological Laboratory of the Brooklyn Institute of Arts and Sciences has just closed its third season of biological work. The session has been the most successful one in its history, and as a preliminary report of the summer's work it will be fitting to give a brief account of the history of the Laboratory, together with its purposes and aims, in order that those interested in the matter may gain a better knowledge of the school.

The Biological Laboratory at Cold Spring Harbor was organized in 1890. It owed its inception to the Brooklyn Institute, and has been established as a branch of that institution of popular education. The foundation of the school was made possible through the generosity of Mr. John D. Jones and the New York Fish Commission. Mr. Jones at the outset contributed a considerable sum of money towards purchasing the equipment of the Laboratory, and the New York Fish Commission offered to the school the use of its buildings and appurtenances located at Cold Spring Harbor, L I. Other friends, among whom may be mentioned Mr. Eugene G. Blackford, Professor Franklin W. Hooper, Dr. Oliver L. Jones, Mr. Louis C. Tiffany, Mrs. H. G. DeForrest, and Miss Julia B. DeForrest, have contributed generously toward the equipment and support of the school. By means of these contributions and from students' fees the Laboratory has been thus far supported. Up to the present time the hatchery of the New York Fish Commission has served as a laboratory building, but the school has reached the limit of the accommodations thus offered, and is hoping to erect a special laboratory building during the coming year, which will be especially adapted to biological work. The Laboratory has been supplied with a launch, collecting apparatus, aquaria, and other appliances necessary for the pursuit of biological work. A library of biological literature has been furnished, and microscopes, etc., have been loaned by the Brooklyn Institute and Wesleyan University. During the present year a beautiful lecture-room has been fitted up for the school by the Wauwepec Society, a society organized by Mr. John D. Jones for local improvement at Cold Spring Harbor. The New York Fish Commission has given the use of its boats, aquaria, pumps, and other apparatus, which has been of great value to the school. Thus equipped, the school has been enabled to enjoy three successful seasons, and to demonstrate the need of further support and better equipment. The Wauwepec Society is contemplating the erection of a laboratory building for its use, and its further growth is only a matter of time.

During its three years of existence, over sixty persons have made use of the advantages offered by the Laboratory, either in study or in investigation. Those attending the Laboratory have included college professors, public-school teachers, physicians, and students of various grades of schools.

The Laboratory was, for the first year, under the direction of Bashford Dean, Ph.D., of Columbia College. During the last two years it has been directed by Professor Herbert W. Conn, Ph.D., of Wesleyan University, who has been assisted by Professor Charles W. Hargitt, Ph.D., of Syracuse University, and Professor H. L. Osborn, of Hamline University. In addition to these, there have been at the school leading biologists from various institutions, including Columbia College, Rutgers College, Trinity College,

University of Notre Dame, and others, who have assisted materially, to the advantage of the school, by numerous lectures, given partly to the students alone and partly to public audiences.

The need of a summer school of biology in the vicinity of New York and Brooklyn has been felt for some time. There are many teachers and students who are on the look-out for methods of passing the summer vacation, which will be at the same time pleasant and profitable. To those interested in natural history science, a summer laboratory of biology offers such an opportunity. The success of the Biological Laboratory at Wood's Holl, and the increasing demand upon its space, have demonstrated the need of other schools of similar character. Moreover, the purpose of the Wood's Holl school of attracting biological investigators, has pointed out the need of a special school of instruction. The Biological Laboratory at Cold Spring Harbor has therefore been designed to fill a somewhat different need than that of the Wood's Holl Station. It is designed primarily as a school of instruction in zoölogy and botany, and not as a special laboratory for investigation, or as a technical school, and is also intended for students rather than for investigators.

Students of biology who make use of our marine laboratories, may be divided into three classes: 1. General students, who, having little or no experience with living animals and plants, desire a general course in zoölogy and botany. This class would include medical students, who find biological study of great value as bearing upon the study of medicine, and who find no time for such work during the school year. 2. College students and others, who, having had a general course in zoölogy and botany, desire to do miscellaneous work of a higher character, or to study embryology from the practical side. 3. Those who desire to undertake original research, either independently or with special guidance. Most of the marine laboratories on our coast have been designed primarily for the third class, although other students are welcomed in some of them.

It has been the design of the school at Cold Spring Harbor to plan its course especially for the first two classes. Every year is seeing a growing demand for the teaching of natural history in our public schools, and the teacher who is in especial demand is the one who has had practical knowledge of his subjects rather than simple book-knowledge. The need of summer schools, where our teachers can gain this familiarity with nature, and at the same time pass a pleasant vacation, is becoming more and more felt. The increasing popularity of summer schools voices this demand. The public-school teacher, who wishes to take a prominent part in the better type of teaching which is rapidly forcing its way into our schools, is beginning to feel the need of practical work; and a few years hence those teachers who have made use of summer schools of practical experiment will be found holding the best positions. The school at Cold Spring Harbor has been designed primarily to meet this demand, and it purposes to offer to all wishing to take good positions in our schools a chance to so familiarize themselves with living things as to make their teaching active and vital instead of mere text-book instruction.

For this purpose an elementary course in zoölogy is arranged, lasting six weeks. During the present summer this course has been given by Professors Herbert W. Conn, Charles W. Hargitt, and H. L. Osborn. It has consisted of daily lectures describing animal types and giving information in regard to different zoölogical topics. The lectures have been followed by laboratory work upon the types described, either by microscopic study or with dissecting instruments. The practical laboratory work is personally directed by the instructor in charge. The course of six weeks thus directed gives a survey of all of the chief types of animals, and, when accompanied by collecting and by such other miscellaneous study as is sure to be suggested by the exigencies of collecting excursions, gives the student a practical knowledge of animals and life which he could not get by a much longer course of study away from the sea-shore. The general course thus given is an elementary one, but at the same time many advanced students find it worth while to follow the course partly as a review, but more especially as a means of studying fresh specimens of types which are familiar to them only from text-book descriptions. Either the whole or parts of this course are, therefore, taken by nearly all the students in the Laboratory.

To add to the value of the Laboratory in general instruction, a course of scientific lectures is given during the summer by well-known scientists from various institutions of learning. These are given in a lecture-hall near the Laboratory and are illustrated by lantern views. During the present summer there have been fifteen lectures in this course upon various subjects connected with geology, zoölogy, and botany. The lecturers have been Professor Herbert W. Conn, Ph.D., Professor Charles W. Hargitt, Professor H. L. Osborn, Professor Henry F. Osborn of Columbia College, Dr. Thomas Morong of Columbia College, Professor Franklin W. Hooper of Brooklyn Institute, and Professors John B. Smith, Byron D. Halstead, and Julius Nelson of Rutgers College. These lectures, though of a high order, are not technical, and are enjoyed by all the students. It is expected next year to add a course in botany of a somewhat similar nature to that in zoölogy for the benefit of those desiring summer work in this subject.

For students who have taken the elementary course or its equivalent and desire more advanced work, no definite line of instruction is laid out, but each student's work is planned for himself. It may be that he wishes to study embryology; he is then set at work upon the development of some animal, and shown how to study its various stages and interpret their meaning, and taught how to preserve specimens for future study. It may be some special group of animals which he desires to study; then the collecting apparatus is put into use to provide him with as large a variety of the group in question as is furnished by the region. It may be microscopic anatomy that he desires; then he is given practical instruction in tissue preservation, section cutting, and staining. But, whatever the line of work such student may choose, it may be independently planned for him, and its chief aim must be in all cases to teach methods of work. For college students who have studied under constant minute direction, this somewhat greater freedom of work with living specimens, rapidly developes independence of thought and accuracy of observation, and is of the utmost value as training for future work.

A special line of work in bacteriological methods has been offered during the last two years. This line of work has no special relation to a marine laboratory, but there are many students, especially among medical schools, who desire to learn methods of bacteriological work, and find no time for it in their regular course. For this purpose practical instruction in making culture fluids and cultures, in separating and determining species of bacteria, is given. A course of twelve lectures upon the history of bacteriology has been given by Professor Conn, during the present summer. The lectures were delivered before the whole Laboratory, and those who wished have taken the practical work of making cultures and the study of the bacteria in water and milk, with other simple elementary bacteriological problems.

Thus it will be seen that the school at Cold Spring Harbor is especially intended for those desiring instruction and facilities for acquiring practical knowledge of biology. But its plans do not end here. Hitherto it has not been able to offer special inducements to those desiring to undertake original research; yet several investigators have been engaged in such work during the last two summers, and it is the design of the management to offer such opportunities as fast as facilities admit and occasion demands. The new Laboratory in contemplation will contain private rooms for research, and will be especially fitted up with reference to this work. Every endeavor will be made to meet the needs of those who desire to use the Laboratory as a place of research. The Laboratory aims first, however, at being an institution of biological instruction and to allow other lines of work to grow as occasion demands.

The session of the Laboratory lasts eight weeks, during the months of July and August. The regular course of lectures occupies the first six weeks, the last two weeks being reserved for reviews and special independent work by the students. The tuition fee for the general course is $20; for the whole session, $25. Board is furnished at $5 per week and rooms can be obtained at a

price varying from $1.50 to $4 per week. The Laboratory is open to both ladies and gentlemen.

Cold Spring Harbor is only about an hour's ride from New York, and is in itself a delightful place to spend the summer. It offers opportunities for bathing, boating, and fishing, and a visitor is never at a loss for some pleasant employment. The New York Fish Commission has one of its hatching stations here, and much of interest and profit accrues to the members of the Laboratory from the study of the specimens in the hatchery. Information as to methods of fish-hatching and fish-culture is to be had simply for the asking; for the staff at the hatchery are on the best of terms with the members of the biological school, and are willing to accommodate them in every way.

In short, the school at Cold Spring Harbor proposes to offer to all interested in biology a method for spending the summer vacation pleasantly and at the same time profitably. Many are inclined to think the summer vacation of our colleges too long; but it is not so to one who attends such a school, for here he gains both recreation and profit. The Laboratory offers him a chance for acquainting himself with living nature and the living principles of biological science. If he is already an advanced student he is offered chances for special work in the line of topics of his own choosing. If he is a teacher, he can get practical experience with animals and plants, and can make collections for his classes; and for the college professor the recreation of the holiday is combined with facilities for research along lines of biological investigation.

Last, but not least, to all is offered opportunity for personal association with educators and original thinkers in lines of science. The school has been successful thus far, and its future promises greater growth and wider influence.

ON SOME HABITS OF AMPHIUMA MEANS.

BY CHARLES W. HARGITT, SYRACUSE UNIVERSITY.

THROUGH the kindness of Professor H. J. Clements, M.D., of New Orleans, I had sent to me from the Louisiana swamps a half-dozen of the so-called "Congo snakes" early last spring. Two of them were adults of from twenty to thirty inches in length, the others being young ones not exceeding twelve inches from "tip to tip." They were shipped in damp gray "moss," Tillandsia usneides, and with a single exception all came through alive and in good condition.

They were, for want of better quarters, placed in an aquarium in which were a number of fresh-water clams (Unio). At first they were quite sluggish and seemed not at all disposed to be "at home" in their new surroundings. This was especially true of the adult. Gradually, however, the young "Congos" began to show signs of interest and appetite. I found an empty clam-shell one morning in the aquarium, and further observation soon explained it. No sooner did a clam show signs of declining vitality by an unusual gaping of the shell than it would be seized by one, often indeed by two, of the amphibians, and there was seldom any release till the shell had been relieved of its occupant. The struggle which ensued when two of them would seize a single clam was exciting and amusing in the extreme. Such tugging, writhing, and twisting into perplexing coils one seldom sees, especially among members of this class.

They proved to be exceedingly voracious; and it was but a short time ere they had disposed of some two dozen clams and had shown a remarkable growth, proving the healthfulness of the diet.

This activity, however, pertained only to the young. The adult became more and more sluggish, and it became evident within a fortnight that it would not long endure the conditions. It moreover became quite ugly of disposition, and would bite savagely at anything within reach, even maiming itself. It was consequently consigned to the dissecting-table.

The clams having been disposed of by the others, they were left for a few days without food. My attention was one day attracted to the aquarium by an unusual commotion, and, to my surprise, upon examination, I found that one of the more thrifty had turned cannibal and had half swallowed one of his less vigorous fellows. He was made to disgorge by a sharp squeeze about the thoracic region, and I hoped the thing was at an end. But in less than an hour the same thing was repeated even more savagely and upon the same victim. I immediately removed both from the tank, killing the badly injured one and leaving the other by itself. Within another day the same thing had been repeated between the two remaining in the aquarian, but was discovered before it had gone so far. They were subsequently fed upon fresh meat from other sources, birds, etc., but did not seem to thrive upon it, finally refusing to take it. They would take earthworms, but showed no disposition to take insect food. One of the number still lives in the same aquarium, and seems fairly at home, so long as fed satisfactorily. It has gone for some time without food with apparently no discomfort. These notes may add something to our knowledge of their probable mode of life. That they are carnivorous is quite certain. At no time did they show any disposition to touch vegetation, though a variety was growing at hand. That under certain circumstances they, with others of their class, will turn cannibal, is also quite certain. I have known the common bull-frog, Rana catesbiana, to devour no less than a half-dozen fair-sized leopard frogs, Rana virescens, within as many days. The same disposition has been noted among the members of other genera. It is less common, indeed rare, between members of the same species and approximately the same size, as was the case under consideration.

NOTES AND NEWS.

BULLETIN 41 of the Purdue University Agricultural Experiment Station contains information of interest and importance concerning wheat as grown in Indiana. The following are some of the points of importance, as given in the Bulletin: 1. Velvet chaff, Michigan amber, and Fultz varieties of wheat have been grown for nine years on the university farm, and rank in value as named, though Michigan amber surpasses Velvet chaff as a rust-resisting variety. 2. Red Clawson and Jones's winter fife are the two most promising recently introduced varieties. 3. For eight years, six pecks of seed sown per acre have given the most satisfactory results. 4. In the region of Lafayette, a higher average yield has been secured from wheat sown Sept. 20 over other dates of sowing. 5. Judicious rotations, including grass, have given better return than constant grain-cropping. 6. Heavy applications of manure and fertilizers to a worn soil growing corn and wheat alternately have given paying returns. 7. The average results of all the experiments at this station with fertilizers and manures upon wheat during the past three years, in full or two-thirds doses, have not been profitable. 8. The use of hot water or copper sulphate failed to destroy the spores of loose smut. 9. Bunt, or stinking-smut, in wheat was successfully destroyed by using hot water or copper sulphate. 10. Early and late harvesting of wheat had practically no effect on yield or weight of grain. 11. Yield of grain and straw were considerably reduced by mowing wheat on certain plats in spring to check rankness of growth. 12. In comparing forms of nitrogen for fertilizing the wheat plant, sulphate of ammonia gave rather better yield than nitrate of soda or dried blood. 13. As the plants fertilized with nitrate were slower to mature than the others, these also suffered more from rust than did the others. Persons interested in a more complete account of these wheat experiments, or who wish the publications of the station, can secure free copies of the same by addressing C. S. Plumb, director of Experiment Station, Lafayette, Ind.

— *The Illustrated American*, which has achieved great popularity as the handsomest illustrated weekly published in our country, has been reduced in price from twenty-five to ten cents. This reduction has been brought about by improvements in its engraving and printing establishment, and, it is claimed, will in no way affect its literary and artistic excellence. This change places within the reach of all a most excellent periodical.

— Harvard University is about to publish a reprint of certain important "State Papers and Speeches on the Tariff," by Hamilton, Gallatin, Webster, and other statesmen, with an introduction by Professor F. W. Taussig.

SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY

N. D. C. HODGES,

874 BROADWAY, NEW YORK.

SUBSCRIPTIONS.—United States and Canada.................$3.50 a year.

Great Britain and Europe.................. 4.50 a year.

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A LABORATORY FOR PHOTOGRAPHIC RESEARCH.

BY ROMYN HITCHCOCK.

THE discussion upon the respective merits of ordinary and color-sensitive plates for photographing stars, which has been raised by the French astronomers, is only a single example out of a great number which might be mentioned to show how much experimental work has yet to be done before our photographic processes will fully meet the demands of scientific investigation. Modern photography has experienced very rapid development. It has been such a fascinating subject for experimentation that a great host of workers, many of them skilful and indefatigable, have contributed a countless array of facts, but intermingled with these are so many observations of a different character that the extensive literature of the subject is very confusing. What, for instance, are we to understand concerning the remarkable phenomena observed by several of the early investigators who found that certain rays of the spectrum produced chemical changes which were reversed by certain other rays? It has seemed to me that this subject would well repay investigation with the improved appliances and better knowledge of the present time. The latest application of the phenomenon that has come to my notice has been at the astro-physical observatory at Washington, in an attempt to photograph the invisible infra-red spectrum by means of a phosphorescent plate. The rays of the spectrum destroy the phosphorescence, leaving luminous bands representing the spectrum lines. It is not probable that any such method will prove of much practical value, but none the less is the investigation of the phenomenon to be advocated for the information to which it may lead concerning the nature of radiant energy.

The fact that Professor Langley has resorted to such a device to photograph the invisible part of the spectrum brings clearly before us the supposed limitations of photography in this direction. The limits of the photographed spectrum have within a few years been greatly extended into the red, and even beyond it perhaps, by special sensitizing agents or by peculiar methods of preparing plates. But the theory of the subject has not been worked out, and in this there is a very important field for research. The inducements to carry out such investigations must come from those who most need the results. In other words, here as in other cases the photographic investigator would like to know that his results will be intelligently applied, else he becomes discouraged and enters upon some other field. If the physical observer would encourage research in photography to meet his requirements, and if the astronomer would have plates perfectly adapted to his purpose, let them cease to place their reliance upon color-sensitive plates, or on any other plates prepared for the public demand, and put their photographic work in the hands of an experienced photographic chemist — not a mere operator picked up in a gallery or among amateur experimenters — but one who can apply the latest discoveries to the work in hand. It is because investigators who are not trained photographers, familiar with the processes and discoveries of the time, have undertaken to do the most difficult kind of photographic work themselves, that the results are so frequently inferior to what they might be. It is certainly a fact that the best photographic knowledge we possess is not generally applied to scientific work.

It is upon such grounds as these that I have long advocated the establishment of a photographic laboratory for research in connection with one of our great institutions. Such a laboratory would not only lead to important discoveries and improved methods, but it would give an impetus to the study of photography as a science involving chemistry and physics, in preparation for work in various branches of science. The problems presented in the observatory and in the spectroscopic laboratory could then be systematically studied, as they cannot be by the workers in these different fields. For example, the astronomer desires plates for photographic star-maps, which shall be uniform in character and rapidity, unaffected by temperature or moisture, free from granularity and without the tendency to "halation" by long exposures. More than this, an effort should be made to produce a plate which will reproduce fairly well the relative actinic magnitudes, if I may coin the expression, if not the visible magnitudes of stars. That such plates can be produced scarcely admits of a doubt, but to establish the fact requires some, perhaps a great deal of experimenting. But having once accomplished the result, it would be a boon to astronomy sufficient in itself to justify the existence and liberal endowment of such a laboratory. The mere discovery of a means to produce plates of absolutely uniform sensitiveness, measured in units of time and also spectrographically, would be of incalculable benefit to physical investigation. As regards the granularity of the image, it has been clearly demonstrated that this is greatly influenced by the development, particularly with certain plates more than others.

Now as regards plates for other special purposes, to mention a case in point, I refer once more to Professor Langley's desire to photograph the part of the spectrum which he has so ingeniously mapped with the bolometer. No one has questioned the accuracy of the indications of that instrument, but it would certainly be of interest to see a photographic reproduction of at least a portion of that invisible spectrum, to compare it with the bolometric curves. It would enable us to interpret the latter with much more confidence when it becomes desirable to reduce the curves to spectrum lines.

As already stated, considerable work has been done abroad in extending the photographic action of the red rays of the spectrum. Schumann, for example, has photographed the spectrum, showing line *A* distinctly and for some distance beyond.

But when we consider the enormous extension of the invisible spectrum beyond the blue, recently photographed by Mr. Schumann,[1] on plates especially prepared for the purpose, we have an indication of the possibilities of scientific research in photography. There is really no reason to suppose that we have reached the photographic limit in the less refrangible end of the spectrum.

The interesting phenomenon of the sun's corona has led to many attempts to photograph it on the rare occasions offered by total solar eclipses. But so little have the photographic conditions been considered in this connection, that, as I have elsewhere remarked, the government photographic expedition was sent to Japan without a photographer, and the expedition to Africa went with commercial color-sensitized plates. Now, it would be interesting to learn the reason for the selection of those particular plates for the corona. While I am not prepared to say that they

[1] Hitchcock, R. The latest advances in spectrum photography, *Science*, Feb. 26, 1892.

were not wisely chosen, the facts in the case not being before me, I am free to confess that I have grave doubts whether they were even as well adapted to the purpose as the ordinary dry plates. In any case, the best work on the corona has yet to be done, with plates prepared for that special purpose, and with apparatus specially arranged. Several efforts have been made in this direction abroad, not with entire satisfaction it is true, but they indicate a recognition of progress in photographic work, and a laudable disposition to apply the latest knowledge to special requirements. I am not aware that any photographic experiments are now under way in anticipation of improved methods to be applied to the solar eclipse next year. If not, we have no reason for expecting any better photographs of the corona than those of Professor Holden, which are doubtless as good as can be made without special plates. Let me add as a purely gratuitous opinion, founded, however, upon long consideration of the subject, that I am convinced of the practicability of photographing the corona without waiting for an eclipse. To do this, however, would require no small amount of preliminary work, for which a well-equipped laboratory is necessary.

Not wishing to extend this communication to undue length, I confine my remarks to these few eminently practical subjects for laboratory research, only adding that there are many others which deserve investigation, such as photographic standards of light and color, methods of recording daily solar activity, the comparison of the chemical and visual effect of light of various colors,—a very important subject in stellar photography,— atmospheric absorption, the application of photography to meteorology, the formation of clouds, lightning, and a host of other subjects which will suggest themselves.

The point I wish specially to make is that a photographic research laboratory would be of the greatest value as an aid to research in many branches of physical investigation. It has been my privilege to visit the laboratories of Dr. Eder in Vienna and Dr. Vogel in Berlin, both of which have contributed so much to a practical and scientific knowledge of photographic methods; but above either of these, for purely scientific research, I should say the private laboratory of Mr. Schumann, in Leipzig, although much more restricted in scope, approaches nearer to my ideal of what we most need in this country.

I trust that these few words will receive such favorable consideration and support from the scientific men of the country — especially from those who have experienced the shortcomings of photography in recording the results of their work — as they may seem to deserve, and that a laboratory such as I have indicated may soon be established either in connection with one of our large universities or by private endowment.

The Woodmont, Washington, D. C., Sept. 9.

THE RETICULATED PROTOPLASM OF PELOMYXA.

BY DR. ALFRED C. STOKES.

WITHIN recent years the structure of protoplasm has been much studied by microscopists, and the several theories enunciated have attracted considerable attention and been the subject of considerable discussion. The entire subject is a fascinating one, but among all the doctrines put forth by various observers, either as the result of personal investigations with modern high-power objectives, or as a result of a working of the "scientific imagination," none has received more attention of a certain kind, and none is more pleasing, than Dr. Carl Heitzmann's theory of the reticulation of the protoplasm. Yet simple and beautiful as his doctrine is, it has been ridiculed and summarily dismissed by those that have failed to obtain results similar to his.

Dr. Heitzmann claims that all animal protoplasm is at all times a net-work of delicate threads, in which is the life of the object, the meshes thus formed containing the liquid or semi-liquid and other non-living constituent parts of the protoplasm. His book on the "Microscopical Morphology of the Animal Body in Health and Disease" is somewhat surprising, since he sees all tissues as formed of reticulated protoplasm, an appearance that he seems to have no difficulty in demonstrating, but which the majority of microscopists and histologists claim to be unable to see, and which they say is therefore non-existent. The subject merits further attention. Judging from a limited experience, but from an experience gained through an eye to a certain extent trained in microscopical examination with high powers, I am willing to confess that the Heitzmann doctrine of the structure of protoplasm is more than satisfying; if it should be proved to be illusory or the result of the action of reagents, I should be disposed to abandon it with regret.

In 1873, Dr. Heitzmann, before the Vienna Academy, demonstrated the reticular structure of the protoplasm of the common *Amœba*, a microscopic animal within reach of every microscopist, and one in which the reticulation should be readily seen with the proper optical appliances, if it exist. I do not know that any effort has ever been made in this country to repeat this observation in order to refute or to confirm it. The white corpuscles of human blood are conspicuously reticulated after treatment with certain reagents, and if the common *Amœba* should present a somewhat similar structure without having been subjected to the action of a chemical solution, the fact would be of great importance and interest. It would seem, too, that microscopists are not living up to their privileges if they fail to heed a suggestion that may be of so great importance. Yet so far as any prominent printed record appears, the common *Amœba* has never been examined with modern high-power objectives by competent microscopists having this object in view. If such papers have been published, they have not come to my notice. I am not claiming any merit on my own part, for I am also one of those that have given no attention to this attractive subject. I have never submitted the *Amœba* to the tests needed to demonstrate, for my own personal satisfaction if for no other reason, whether or not the reticulum exists in its protoplasm as Dr. Heitzmann says it exists. But that at certain times in certain places within all animal bodies the structure of protoplasm is reticular there can be no doubt. That the reticulum exists at all times and in all places is another matter.

But recently, while I was making a microscopical examination of a sample of urine, a single scale of epithelium appeared under the objective in a drop of the fluid, and was as perfectly and superbly reticulated as could be desired by the most ardent advocate of the theory. The cell had had no treatment except what may have come from its soaking in the urine, yet the net-work of its protoplasm was perfection, and its prominence must have forced itself upon the attention of any microscopist. But thousands of epithelial scales may be studied in as many samples of urine, and not another found in this beautiful condition.

In reference to the common *Amœba*, although I have never yet studied it with the reticulation of its protoplasm in mind, I have recently had the satisfaction of examining a favorable specimen of the allied *Pelomyxa villosa* Leidy, in whose ectosarc the reticulum of the protoplasm was as perfect and as conspicuously marked as in the single epithelial scale just mentioned. *Pelomyxa* is a common Rhizopod in this locality (Trenton, N. J.), but it is usually so gorged with food, with sand grains or with other opaque particles, that its body is almost black by transmitted light, and therefore unsuited for such a purpose as a search for protoplasmic reticulations. But this particular individual was without these obscuring elements, being almost transparent, and fortunately with the protoplasm of the ectosarc so conspicuously reticulated as to obtrude itself upon the microscopist's notice. If the softer and continuously flowing endosarc had been surrounded or enclosed within a delicate net of cords, the reticulations could not have been more apparent or more distinct, becoming even more conspicuous when this external coating flowed out to cover a newly produced pseudopodium. The meshes of this beautiful net were angular, and the living threads that formed them were rather actively contractile, the meshes becoming narrowed and elongated during the animal's movements of progression. The greatest length of perhaps the largest space was, during quiescence, about one six-thousandth of an inch, the smallest being probably about one-third of that size, although careful measurements were not made of either of these.

There can be no doubt that at least at times the ectosarc of *Pelomyxa villosa* is formed of reticulated protoplasm. That it is

always so constituted further investigation should determine. As it is comparatively immense, its examination is not so difficult as is that of the smaller *Amœba*, the study of which, with this special object in view, would demand greater care and an eye trained by practice over the microscopically minute. The subject and the facts are important by reason of their bearings upon the minute examination of objects that may, perhaps, possess a more utilitarian purpose than either the common *Amœba* or the almost equally common *Pelomyxa*.

The examination in this case was made with Bausch & Lomb's homogeneous immersion one-eighth, Reichert's oil-immersion one-twelfth, N. A. 1.40, and Gundlach's homogeneous-immersion one-twentieth, N. A. 1.20.

Trenton, New Jersey.

GLACIATION IN WESTERN MONTANA.

BY HERBERT. R. WOOD.

THE evidences of glaciation in western Montana are very apparent from Helena to Hope (Idaho). They are shown by a series of parallel valleys with a north and south trend, and another series of rounded oblong isolated valleys, connected by narrow necks of land along river bottoms between mountain chains. The former follows the strike of the rocks, occurring along contact lines, synclinal folds, shore or marginal beds of the Sub-Carboniferous formations; the others cross the strike, and, like the former, are also largely the result of pre-glacial denuding forces. The direct evidences are erratic blocks, terminal moraines (frequently holding back lakes), clays, striæ, gravels, etc. The main range of the Rockies (5,550 feet, at Mullan, above the sea), consisting of Devonian, Carboniferous and Sub-Carboniferous, has a valley on the west in the upper Cambrian. Further north-west the glacial striæ run 45° north of west, the general course of valley being 30° north of west.

The elevation at the boundary here is 4,000 feet above the sea; 100 miles south of this it is 3,200 feet, in vicinity of Missoula. From the summit of the main range, as given above, to Hope, Idaho, 300 miles, the fall is over 3,000 feet (5,550 — 2,200). The fall from the boundary is not constant; at Libby, near Idaho, the height is 2,000 feet, forty miles south of this it is 2,500 feet. While the glacial action has been generally from the north, at 100 or 150 miles from the boundary seems to have been the end of the terminal moraines; and a series of glaciers came from the south — the higher elevations of the Bitter Root Range. The great Flathead Valley, which lies west of 114° and extends south from the boundary for 150 miles to Ravalli, is about 30 miles wide. In its southern portion a lake is situated, which is about 35 miles long, dammed by a terminal moraine 200 feet high. The lake is 1,000 feet in depth, its northern shore being a plain, extending for 30 miles, representing an old lake-bed. Another moraine extends across the northern part of this plain, making the boundary line of its northern shore. Such a glacier that could produce this excavation must have been 2,000 feet in thickness and 25 miles wide. Heavy beds of clays, 150 feet in thickness, cover the plain, with a few boulders and thin beds of sand in its lower layers, which is followed by gravels. The worn-down roots of a mountain range are noticeable at both the north and south shores of the lake. This valley runs along the shore line of the lower Cambrian quartzitic series. Some glaciated valleys enter this from the west. The direction of this great glacier seems to have been south-east, crossing a range of mountains 20 miles to the east, which it has left hummocky and worn. Ninety-eight miles west of this the Cabinet Range, 30 to 40 miles long, 7,000 to 10,000 feet high, on the borders of Idaho, shows marked glaciation, the striæ having a course 42° south of west. The height, at Libby on Kooterian, above the sea here is 2,000 feet. The glacial detritus piled along the flanks of this anticlinal is 700 feet in thickness, and represents the material from the gulches. At Hope Pend O'reille Lake the glacial action has undoubtedly been very great, the lake being 2,000 feet deep, with a mountain 4,000 feet above the sea to the north of it. The town is 2,000 above the sea. A number of islands in the lake are scoured down to the water's edge. They represent mountains which may have risen as high as that mentioned. The striations are 40° west of north, 42° west of north. A terminal moraine has dammed the river (Clark's Fork of the Columbia), which enters it from the east, and turned it a mile to the south. Pre-glacial action has been active here and at Libby (see above), some 6,000 feet of strata having been removed from the summit of the Cabinet anticlinal, most of it being pre-glacial denudation. Lake Pend O'reille may perhaps fitly be a glacial lake, a rock basin, which has been filled by the waters of the Columbia. The greatest length of the lake is along the strike of the rocks, though this has not been an important feature in moulding its form, but rather the action of glacier, boulders of diabase and granite being observed several hundred feet above the lake along the mountain side. At Clark's Fork, 20 miles east, I observed granite boulders, on a mountain, at a height of 1,800 feet, or about 4,000 feet above the sea. Heavy beds of gravels, clays, and boulders fall on the valley of the river (Columbia) for 60 miles, the general direction being east and west. At Thompson the glacier has scoured down a range to the south, the path of the glacier being here apparently south-west. A series of terraces extend along the north side of the river, with large blocks of slates (presumably of pre-Cambrian age). At Horse Plains a small valley running east and west represents an old post-glacial lake bed. The glaciers here came from the north, piling up heaps of clays and gravels along the north hummocky side of the valley. One large erratic block of limestone (upper Cambrian) measured 12 × 15 × 18 feet. It was perched about 400 feet above the valley on a diabase dike. This point is 75 miles west of Missoula and about 2,460 feet above the sea. At Missoula a large gravel plain (an old lake-bed), of 40 or 50 miles square, lies in the midst of the lower-Cambrian rocks. To the north the cretaceous rocks dip into the mountains eight miles distant at an angle of 30° north-west. The glaciers have greatly denuded this cretaceous belt into low foot-hills in their path from the mountains (8,000 feet above the sea) 8 or 10 miles north. Moraines flank the mountains, large blocks of slates and quartzites from the Cambrian rocks resting at the mouths of creeks and stretching across the old lake beds. Around the mountains a series of beaches or beach-lines extend; I have counted 26 of them one above the other, extending upward for nearly 2,000 feet above the plain. These beach-lines I have traced for 50 miles. They seem to represent a pretty general upheaval following upon the close of the cretaceous period. The depth of the gravels which form the old lake-bottoms must be very great. They consist of Cambrian quartzites. To the south of Missoula extends a long valley (terraced) for 75 miles. It lies to the east of a gneissoid range or a bedded quartz porphyry porphroidal or gneiss coeval with Pilot Knob of Missouri and the older Archean gneisses. A glacier undoubtedly travelled to the north, cutting out a range of Cambrian rocks, dipping south, nine miles south of Missoula, connecting it with the old lake previously mentioned. To the north-west of Missoula are several small valleys, through which the Blackfoot River runs. They all run east and west or nearly so across the strike of the rocks, and are divided by low, rounded, hummocky ranges, over which the glaciers have passed. Stratified gravel deposits are exposed along river banks, 75 feet in thickness. One valley, about 12 miles long, running along the strike of the rocks, which dip east, has a moraine at its northerly end made of thickly scattered angular boulders and clays, and of a terrace-like nature, rising 200 feet above the river, which has here cut through it. Ten miles further north another moraine occurs, and five miles further north a great moraine of several hundred feet in thickness and holding ponds and small lakes in its surface. These seem to show, so far as a hasty examination would permit, points in the recession of a great glacier whose course was south-west. A few generalizations from these facts show pretty conclusively that.

1. The rivers are nearly all of pre-glacial origin, but probably post-cretaceous, one or two having been deflected in their courses by the glaciers.

2. The denudation has been largely, if not in greater part, pre-glacial.

3. No apparent upheaval has occurred since the glacial period, but a series of beach-lines indicate a pretty general elevation folowing the cretaceous period.

4. The general trend has been south, south-east, and south-west, but frequently deflected east and west by ranges and pre-existing valleys. The great Flathead glacier west of 114° shows a length of 150 miles from boundary. Along a line 150 miles south of boundary, which rapidly swings to the north as we go westward, the lower limits (moraines) of this series of glaciers is evident. To the south of these the glaciers have had a northerly trend, forming a series of valleys running north and south. Short glaciers, radiating from local heights, as at Libby, and Missoula and various other places, were common. Some of these have no doubt been persistent for some time since the glacial period proper.

5. With the recession of the glaciers the lakes were drained to the west.

6. Existing glacial lakes are four or five in number. They are rock-basins eroded no doubt greatly before the glacial period. In nearly all cases they are dammed by terminal moraines.

7. The area touched upon is 300 miles (E. and W.) by 100–150 miles (N. and S.). The fall being to the west and south as noted; on the map it may be found from the 49th parallel on the north to the 47th on the south, from the Rockies (main range on east) to Idaho boundary-line.

8. Terraced valleys of much interest occur, but to which no detailed study has been given.

THE SHRINKAGE OF LEAVES.

BY E. E. BOGUE.

PROBABLY every maker of botanical specimens has observed that the leaves when dry are smaller than when fresh. The wish to know how much the shrinkage might be led to the following measurements. The leaves were measured before they had wilted, and after they were perfectly dry.

The longest dimensions were taken in each case. The width or dimension across the midrib is first given in each case; the first column shows the measurements when fresh, and the second column the measurements when dry. All measurements are given in inches and parts of an inch.

Scarlet Oak (Quercus coccinea).

Fresh.	Dry.
$7\frac{3}{8} \times 12\frac{1}{2}$	$7\frac{3}{16} \times 12\frac{5}{16}$
$6\frac{1}{8} \times 11\frac{1}{2}$	$6 \times 11\frac{3}{8}$
$6\frac{5}{8} \times 12\frac{1}{2}$	$6\frac{9}{16} \times 12\frac{7}{16}$
$6\frac{1}{4} \times 12$	$6\frac{1}{8} \times 11\frac{13}{16}$

Arisæma triphyllum (Indian Turnip).

$4\frac{13}{16} \times 9$	$4\frac{3}{4} \times 9$
$5\frac{1}{4} \times 8\frac{3}{4}$	$5\frac{1}{4} \times 8\frac{5}{16}$
$4\frac{1}{2} \times 7\frac{3}{4}$	$4\frac{1}{2} \times 7\frac{1}{2}$
$4\frac{3}{4} \times 7\frac{3}{16}$	$4\frac{11}{16} \times 7\frac{1}{6}$
$5\frac{3}{16} \times 7\frac{1}{2}$	$5\frac{1}{8} \times 7\frac{1}{2}$

Asimina triloba (Common Papaw).

$4\frac{7}{8} \times 12\frac{5}{8}$	$4\frac{3}{8} \times 12\frac{5}{8}$
$4\frac{7}{8} \times 13$	$4\frac{1}{4} \times 12\frac{7}{8}$
$3\frac{7}{8} \times 10\frac{7}{8}$	$3\frac{13}{16} \times 10\frac{9}{16}$
$4\frac{1}{16} \times 12$	$4 \times 11\frac{7}{8}$
$5 \times 13\frac{7}{8}$	$4\frac{7}{8} \times 13\frac{3}{4}$

Arctium Lappa (Burdock)

$9\frac{5}{8} \times 15\frac{3}{4}$	$9\frac{1}{2} \times 15\frac{3}{4}$
$11\frac{5}{16} \times 17\frac{7}{16}$	$11 \times 17\frac{1}{4}$
$9\frac{1}{2} \times 14\frac{3}{4}$	$8\frac{7}{8} \times 14\frac{7}{16}$

Asclepias cornuti (Milkweed).

$4\frac{1}{2} \times 7\frac{15}{16}$	$4\frac{1}{16} \times 7\frac{13}{16}$
$4\frac{1}{2} \times 9\frac{1}{4}$	$4\frac{1}{16} \times 9$
$4\frac{1}{2} \times 9\frac{3}{16}$	$4\frac{3}{8} \times 9$
$4\frac{1}{8} \times 9\frac{1}{16}$	$3\frac{15}{16} \times 8\frac{7}{8}$
$3\frac{13}{16} \times 8$	$3\frac{11}{16} \times 7\frac{3}{4}$

Acer saccharinum var. nigrum (Sugar Maple).

$5\frac{7}{8} \times 5\frac{1}{16}$	$5\frac{3}{4} \times 5$
$6\frac{11}{16} \times 5\frac{7}{8}$	$6\frac{5}{8} \times 5\frac{13}{16}$
$7\frac{7}{8} \times 5\frac{7}{16}$	$7\frac{3}{4} \times 5\frac{3}{8}$
$7\frac{5}{8} \times 5\frac{7}{8}$	$7\frac{1}{4} \times 5\frac{13}{16}$
$6\frac{7}{16} \times 5\frac{1}{4}$	$6\frac{3}{8} \times 5\frac{1}{4}$

Abutilon avicennæ (Velvet-Leaf).

$8\frac{5}{16} \times 8\frac{5}{16}$	$8\frac{1}{4} \times 8\frac{1}{4}$
$9 \times 9\frac{5}{8}$	$8\frac{7}{8} \times 9\frac{1}{2}$
8×8	$7\frac{7}{8} \times 7\frac{13}{16}$
$3 \times 3\frac{1}{8}$	$2\frac{1}{16} \times 3$
$9\frac{3}{16} \times 8\frac{7}{8}$	$9 \times 8\frac{3}{4}$
$9 \times 9\frac{1}{4}$	$8\frac{3}{4} \times 9$
$8\frac{1}{2} \times 8\frac{1}{2}$	$8\frac{7}{16} \times 8\frac{1}{2}$

Rumex obtusifolius (Bitter Dock).

$5 \times 11\frac{1}{4}$	$4\frac{7}{8} \times 11$
$4\frac{11}{16} \times 8\frac{1}{2}$	$4\frac{7}{16} \times 8\frac{1}{8}$

Platanus occidentalis (Sycamore).

$8\frac{1}{4} \times 6\frac{1}{2}$	$8\frac{1}{16} \times 6\frac{5}{8}$
$8\frac{7}{8} \times 7\frac{1}{8}$	$8\frac{3}{4} \times 6\frac{7}{8}$
$9\frac{1}{4} \times 6\frac{1}{2}$	$8\frac{3}{4} \times 6\frac{1}{2}$
$7\frac{5}{8} \times 6\frac{1}{16}$	$7\frac{1}{4} \times 6$

Nymphæa odorata (Sweet-scented Water-Lily).

7×7	$6\frac{1}{4} \times 6\frac{1}{4}$
$10 \times 8\frac{3}{4}$	$9 \times 8\frac{1}{4}$
$8\frac{1}{2} \times 7\frac{3}{4}$	$7\frac{1}{2} \times 7$
14×14	13×13
$11\frac{1}{4} \times 10\frac{1}{2}$	$10\frac{3}{8} \times 9\frac{11}{16}$

Nelumbo lutea (Yellow Nelumbo).

$11\frac{15}{16} \times 12\frac{1}{2}$	$11\frac{5}{8} \times 11\frac{15}{16}$
$13\frac{1}{2} \times 14\frac{3}{8}$	$13\frac{1}{4} \times 13\frac{7}{8}$
$12 \times 12\frac{1}{4}$	$11\frac{5}{8} \times 11\frac{3}{4}$
$12\frac{3}{4} \times 13\frac{5}{16}$	$12\frac{1}{2} \times 12\frac{3}{4}$
$12\frac{1}{4} \times 12\frac{1}{4}$	$11\frac{13}{16} \times 11\frac{7}{8}$
$9\frac{1}{16} \times 9\frac{1}{2}$	$9 \times 9\frac{1}{16}$

The leaves were pressed enough to keep them from wrinkling. A piece the size of a mounting-sheet ($11\frac{1}{2} \times 16\frac{1}{2}$) was cut from a leaf of the Nelumbo, and was found to decrease from that size to $11 \times 15\frac{1}{16}$. It will be seen that the least shrinkage was in the Indian turnip (the measurements here referring to leaflets), and the greatest shrinkage in the water-lily. Petioles of the sugar-maple were measured and ranged from $2\frac{3}{4}$ to $4\frac{7}{16}$ in length, but were shortened by drying, if at all, less than $\frac{1}{16}$.

It will be noticed that in the velvet leaf the small immature one decreased more even than the largest one.

Ohio State University, Sept. 10.

LETTERS TO THE EDITOR.

Pre-Aino Race in Japan.

I MUCH regret that Prosessor Morse should think that I have intentionally misrepresented or carelessly disregarded his views concerning the pre-Aino occupancy of Japan, as he rather vigorously maintains in *Science* of Sept. 9. It can scarcely be said that I have claimed for myself the discovery that there was a race of people in Japan before the Ainos. The most I have endeavored to show is the possibility,—I do not even go so far as to suggest the probability,—that the pre-Aino inhabitants of Japan may have been the people who dug the pits in Yezo.

As regards the Aino occupancy of Japan, Professor Morse will find that the "historical records" of the country, which he mentions, have not been disregarded in my article, and, in fact, the evidences of the shell heaps are, to my mind, the least convincing of any, until the fact of the Aino origin of them is established. It is the historical evidence, the distribution of geographical place-names, and, last but not least, Japanese tradition, which are at present the strongest evidences in this connection.

An author may be criticised for sins of omission, and even for

errors due to misapprehension; but to charge him with neglect and wilful misrepresentation of another's views involves a presumption of motives which, I trust, are not common among students of science. I have the highest regard for Professor Morse personally and for his valuable and painstaking work in Japan, not only upon this subject but upon others, and I certainly would not willingly misrepresent his views nor disregard them. He will no doubt have observed that this part of the subject is treated in a much briefer manner than might have seemed desirable, otherwise I do not think he would have found any cause for complaint. ROMYN HITCHCOCK.

The Woodmont, Washington, D.C., Sept. 12.

On Biological Nomenclature.

PROFESSOR UNDERWOOD'S article in *Science* for Aug. 26 calls for a general expression of views on this subject. The article above referred to was written from the standpoint of the botanist, while the present one will be perhaps more from a zoölogical standpoint. The writer, however, recognizes no distinction between the two, and firmly believes that the system of nomenclature should be absolute and uniform for all branches of biology. Absolutely the same rules should be recognized throughout the departments of botany and zoölogy, and these rules and regulations ought to be speedily decided upon by a congress of the leading biologists of the world, to which every country and organization so interested should send delegates. In the meantime every one follows his own particular ideas in regard to the matter, which may be either right or wrong.

I desire here to express my unprejudiced but very decided views on the seven questions which Professor Underwood puts, and will preface them with the remark that in no case can the name of the original erector and describer of a genus or species be separated therefrom without gross injustice.

1. Shall there be an initial date in nomenclature? Let us by all means recognize the validity of the first names proposed when accompanied by a sufficiently recognizable description and not preoccupied. In some cases, as with many of the older authors, descriptions must be recognized which would not be considered sufficient at the present day.

2. Shall names long used be laid aside when claimed for other plants [or animals] on grounds of strict priority? They should, when it is unmistakably evident that the original describer so intended.

3. Shall "the first name under a genus" hold against a previous specific name? By no means. The specific name first proposed should, coupled with the name of its original describer, follow the name of whatever genus it may be finally relegated to.

4. Shall varietal names have priority over established specific names? Yes, but with the name of the original proposer attached. I do not agree with Professor Underwood on this point, but believe that varietal names lay claim to the same priority as specific names, *when they are found to be valid.*

5. Can inappropriate names be cancelled on that ground alone? They cannot with any degree of justice.

6. How far has a later writer a right to correct names previously established? He has no right whatever to in any way change the spelling of a name from what was intended by the original describer. If by a typographical error the name was printed wrong, and the author corrects it later in print, his correction should be accepted. I am strongly in favor, however, of beginning *all* specific names with small letters, whatever their origin, and making all compound specific names into simple terms by writing them with the hyphen dropped. I would write *Brevoortia idamaia* Wood, or *donnellsmithii*, or *mariaewilsoni*, to use Professor Underwood's examples. I have no right to change the endings in any way whatsoever, neither have I the least right to supply a syllable apparently omitted, judging from the derivation. I would not consider that I had the power to elide or supply a single letter, if by such act I changed the term from what was originally proposed and intended by its describer. My conviction is that, except in manifest errors of *typography*, names should be let alone. Errors of orthography may be left to stand.

7. What credit should be given for generic and specific names? Write the name of the author of the specific name, *without* parentheses, whether there have been a dozen transfers or none at all to a new genus. There is no necessity whatever for shedding glory upon the one who made the transfer. Usually he erects a new genus to accept the transferred species, and the fact that his name will go down the corridors of time coupled to the genus he erected is glory enough. He has no right whatever to the species. Even if he does not erect the genus, he certainly has full credit in the literature for making the change, and the act does not demand recognition in the system of nomenclature itself.

I would write *Metzgeria pubescens* Schrank, to use the example given in the article referred to, and make no more ado or trouble about it. This signifies *always* that the authority named described the species originally and originally proposed that name. The founder and date of the genus can be ascertained by referring to any monograph. The generic conceptions of the original authority should not enter into consideration at all.

As to the question of "once a synonym, always a synonym," I believe in the negative. If a form, which had been described and then thought to be the same as some other species, is later proven to be a valid species, the name originally proposed should stand.

Generic names should not agree too closely in orthography. I should say that *Richardia* ought to preclude *Riccardia;* certainly *Cæsia* should preclude *Cesia.* I do not think that different derivation, or original meaning, presents any excuse for similarity of terms. The difference should be sufficient to preclude any possibility of error on the part of a student unfamiliar with both terms. I believe also that a generic term already used in botany should not be proposed in zoölogy, and *vice versa.* I would be cautious about changing those which have already been of long standing, however.

Lastly, specific names should never be capitalized or written with a hyphen; and no comma should be inserted between the specific name and its authority. It would be a great boon to biologists if absolute uniformity could be infused into the system of nomenclature. C. H. TYLER TOWNSEND.

New Mexico Agricultural College, Sept. 1.

Grand-Gulf Formation.

I HAVE read with great interest recent contributions to the literature of the Grand-Gulf formation, including Professor Hilgard's valuable paper in the *American Journal of Science* and Judge L. C. Johnson's letter in your last issue. As I have recently been summarizing our knowledge of the Post-Eocene Tertiary (to appear shortly in Bulletin 84, U. S. Geological Survey, which is already in type) I am moved to add a few words in regard to the subject for your columns, which I have already expressed in correspondence with several of those interested.

At the time of the Grand-Gulf sedimentation the lower valley of the Mississippi was already the theatre of estuarine conditions and operations, which date to a very ancient geological time. Toward the end of the Chesapeake or newer Miocene epoch this gulf extended far into the interior, its south-eastern point of entrance being somewhere in the meridian of Mobile, or between Mobile and the Appalachicola River. The embayment, which I have called the Gulf of Mississippi, received an immense drainage, corresponding to that of the whole Mississippi valley and perhaps that of the upper lakes of the present St. Lawrence system. The operations in progress consisted in the transfer of material from the elevated interior to this gulf by the medium of the drainage, and in all probability a gradual or intermittent shifting of level as weight was removed from the uplands and deposited beyond the shore-line. The shallows, as I conceive it, sank and the interior rose, thus preserving a sort of balance, and there is some reason to suppose that a specially important movement took place at the end of the Grand-Gulf epoch, by which the more energetic degradation characterizing the Lafayette epoch was inaugurated, the Strait of Georgia closed, and the previously existing islands of central Florida were joined to the mainland. I agree entirely with Hilgard's view that elevation was essential for the geological operations which are recorded in the stratigraphy of these two epochs.

The Grand-Gulf strata show gravels, sands (now frequently

converted into quartzite), and clays. They were laid down in water which was too brackish at times for the establishment of a fresh-water fauna in the estuary and too fresh for a marine fauna. In short, the conditions were those of an estuary during a period of rather rapid sedimentation. This estuary probably was, as many southern estuaries are now, defended from the sea by low bars or sand islands, on the seaward side of which a marine, probably Chesapeake, fauna flourished, whose remains are now buried 700 to 1000 feet below the level of the Gulf of Mexico. On the shores grew palmettos, and drift-wood in abundance brought down by the rivers was strewn upon them. I regard it as likely that part of the gravels bored through by artesian wells, in the axis of what was the Gulf of Mississippi, are referable to an earlier period than that of the Grand-Gulf epoch, since the same processes were at work there throughout the whole of the Miocene. Coëval with the sediments of the Grand Gulf were marine deposits along the shores of the Gulf of Mexico, both east and west of the entrance to the Gulf of Mississippi. As the erosion of the land became more complete the slope of the drainage became less, the currents slower and the sediment finer and lighter, fine sand and clay replacing the gravel and coarser material of the earlier part of the epoch. In short, the clays to which Johnson has applied the name of the Pascagoula formation, began to be laid down, the sea was less energetically pushed back by the outflowing river-waters, and the conditions became more favorable for the establishment of a brackish-water fauna.

The word formation has been used very loosely in American geological literature. In the sense in which we use the term for the Chesapeake Miocene, or the Grand Gulf, or Lafayette rocks, I conceive that these clays do not constitute a formation. They really represent for me a phase, the latest and most gentle, of the Grand Gulf, which is represented by the sands with palmetto leaves above the Chesapeake strata in the section at Alum Bluff on the Chattahoochee River. We may, slightly modifying Johnson's term, refer to them as the Pascagoula clays.

A correction is also required in the definition of these clays, or rather the fauna they contain. It is not, as supposed by Johnson, a marine fauna. All the species are or may be a part of a strictly brackish-water formation. The collections of Johnson, as well as material from the Mobile well, have been in my hands for study. The fauna comprises a large oyster, a small *Gnathodon*, which I have described under the name of *G. Johnsoni*, a small *Mactra*, also found in the Chesapeake Miocene, fragments of a *Corbicula*, and a *Hydrobia*, which I have named *H. Mobiliana*. The supposed *Venus* of which Judge Johnson speaks is the young of the *Gnathodon*. All these species are characteristic of estuaries, and will be discussed in my "Tertiary Mollusks of Florida," of which Part II. is now printing. The depth at which this fauna is encountered in the Mobile well is 735 feet, which gives an average dip from the locality near Vernal, Miss., where it comes to the surface, of about 25 feet to the mile; which corresponds very well to the dips of other strata of the Tertiary, which have been similarly traced. We are under serious obligations to Judge Johnson for the material he has so assiduously collected and which has helped so much to determine the geology of our southern tertiary formations.

WM. H. DALL,
Palæontologist U. S. Geol. Survey.

Washington, D. C., Sept. 13.

European Origin of the Aryans.

REFERRING to Dr. Isaac Taylor's letter in *Science*, Sept. 9, I must say that I cannot conceive how he can make the statements it contains, if, as he alleges, he has "carefully read" Omalius D'Hallow's writings.

Dr. Taylor's words are, "The comparatively modern theory that the Aryan race originated in the highlands of Central Asia, a theory of which D'Halloy does not seem to have heard." Now, in the article published in 1848, D'Halloy has these words: "On a voulu tirer la conclusion que ces langues (indo-germaniques) derivaient du sanscrit, et que tous les peuples qui les parlaient etaient originaires de l'Himalaya, deux propositions qui sont loin d'être incontestable."

As if this was not enough to make it clear as to what theories he was attacking, he specifically states in a note to page 19 of his "Eléments d'Ethnographie," referring to this article in the Bulletin of the Belgian Academy, that it was directed against the linguists who derived the modern European languages and peoples from Central Asiatic ancestry; whereas it was his view that the ancient Persian and Indian tongues were imported from Europe into Asia.

I imagine that if Dr. Taylor had not had before him the "necessity of modifying former [printed] statements," he would not have overlooked this positive testimony by Omalius to himself.

Media, Pa., Sept. 12. D. G. BRINTON.

The English Sparrow and Other Birds.

MY experience with the English sparrow accords with that of your correspondent X. in your issue of Sept. 2, 1892. Before this sparrow came and multiplied largely, my lawn was populated with cat-birds, red-birds (Cardinal grosbeck), robins, doves, bluebirds, yellow-birds, tomtits, chipping sparrows, wrens, etc.; but now the English sparrow has full possession of the entire premises. Now and then a cat-bird or a red-bird slips in as if to see whether he may again bring his family to their old umbrageous quarters, and to the rations which were provided for their support; but he is not reassured, and soon disappears.

The fecundity, energy, and perseverance of the little vandals are amazing. When the small fruits are abundant it requires a week of active shot-gun work to make them even cautious in visiting the fruit-garden. Some of them last spring took a notion to establish nests on the tops of window-shutters which opened under projecting eaves, and although their nests were swept off almost daily, they immediately began in each case to rebuild on the same spots, and continued this for at least a fortnight. In their nesting, as in some other things, they display more perseverance than discretion. The cats found that they were building in considerable numbers in a large hay-loft, and suppressed many a germ of mischief. The sparrows sometimes swarm like flies in the stable, where they will enter the troughs of horses, cows, and pigs whilst the animals are feeding.

I no longer shoot owls or hawks, but give them a welcome, and every cat and nest-hunting boy has the freedom of my premises.

Lexington, Va., Sept. 12. W. H. RUFFNER.

BOOK-REVIEWS.

Annual Report of the Board of Regents of the Smithsonian Institution to July, 1890. Washington, Government Printing Office, 1891.

THE Smithsonian Report for 1890 contains: First, the proceedings of the Board of Regents for the session of January, 1890; second, the report of the executive committee exhibiting the financial affairs of the institution, including a statement of the Smithson fund and receipts and expenditures for the year 1889–1890; third, the annual report of the secretary giving an account of the operations and condition of the institution for the year 1889–1890, with statistics of exchanges, etc.; fourth, a general appendix comprising a selection of miscellaneous memoirs of interest to collaborators and correspondents of the institution, teachers, and others engaged in the promotion of knowledge. This volume is also profusely illustrated, adding greatly to its value and interest. Among the illustrations are maps of the National Zoölogical Park; maps of the Niagara River; maps of Central Africa, before and after Stanley; pictures illustrating primitive urn burial, the age of bronze in Egypt, specimens of quartz fibres; and many others too numerous to mention in detail here.

The object of the memoirs included in the general appendix is to furnish brief accounts of scientific discovery in particular directions; occasional reports of the investigations made by collaborators of the institution; memoirs of a general character or on special topics, whether original and prepared expressly for the purpose or selected from foreign journals; and briefly to present (as fully as space will permit) such papers not published in the Smithsonian Contributions or in the Miscellaneous Collections as may be supposed to be of interest or value to the numerous correspondents of the institution.

Among the papers of special interest are those by J. Scott Keltie on "Stanley and the Map of Africa;" the "Age of Bronze in Egypt," by Oscar Montélius; the "Primitive Home of the Aryans," by A. H. Sayce; a "Primitive Urn Burial," by J. F. Synder; "Criminal Anthropology," by Thomas Wilson; "Antarctic Exploration," by G. S. Griffiths; "The History of the Niagara River," by G. K. Gilbert; and Weismann's "Theory of Heredity." The recently published translation of Professor Weismann's essays on heredity and allied topics has aroused the interest of the general public in the system of his biological ideas. Mr. George J. Romanes has undertaken a difficult task in endeavoring to present Professor Weismann's different theories on the subject, in a condensed form, but he has succeeded admirably. The papers on "The Ascent of Man," by Frank Baker, "The Antiquity of Man," by John Evans, and "The Progress of Anthropology" in 1890, by Professor Otis T. Mason, are of great value to those interested in the science of anthropology. The ancient problem of the squaring of the circle, which trained and untrained minds have striven in vain to solve for two and a half thousand years, is ably discussed in a paper by Hermann Schubert He makes an historical sketch of the problem from the earliest times to the present day, tracing the various theories from the times of pre-Grecian antiquity to the verdict given by Professor Lindemann of Königsberg in June, 1882: "It is impossible with ruler and compasses to construct a square equal in area to a given circle." These are the words of the final determination of a controversy which is as old as the history of the human mind. But the race of circle-squarers, unmindful of the verdict of mathematics, that most infallible of arbiters, will never die out so long as ignorance and the thirst for glory shall be united.

"The Progress of Astronomy" during 1889 is clearly shown in the paper by William C. Winlock, the compiler having made free use of reviews, in the various branches of astronomy, contributed by specialists to the *Athenæum*, *Nature*, *Journal of the Astronomical Society of the Pacific*, the *Observatory*, *Bulletin Astronomique*, the *Astronomical Journal*, and other periodicals. Among these are articles on stellar parallax, comets, meteors, variable and colored stars, stellar spectra, astronomical photography, the planets, solar spectrum, the sun, the solar system, and the minor planets. Astronomical bibliography for 1889 is given at the conclusion of this paper including the most important books and articles for that year, which have attracted the compiler's notice; some few titles having been taken from reviews and catalogues, where the publications themselves have not been accessible. The title of the paper by Robert Simpson Woodward on "The Mathematical Theories of the Earth" implies a community of interest amongst astronomers and mathematicians. In fact, the study of the earth's crust, considered in its entirety and in its relations to similar bodies of the universe, has long been the special province of astronomers and mathematicians. Since the times of Galileo, Kepler, and Copernicus, it has supplied a perennial stimulus to observation and investigation, and it promises to tax the resources of the ablest observers and analysts for some centuries to come. The structure of the earth, as a mechanical and physical question, is closely cennected with the origin and formation of its satellite and of the planets and satellites belonging to the same solar system. A paper "On the Physical Structure of the Earth," by Henry Hennessy, treats of this subject, under the following headings: "the mechanical and physical properties of the matter composing the earth, the rotation of the earth considered as partly fluid and partly solid," and a note concerning "the annual recession calculated on the hypothesis of the earth's solidity." The papers on "Glacial Geology," by Professor James Geikie; "The Mediterranean, Physical and Historical," by Sir R. Lambert Playfair; and the "History of Geodetic Operations in Russia," by Colonel B. Witshowski of the General Staff, and Professor J. Howard Gore, are full of interest.

The paper on "The Physical Basis of Musical Harmony," by Professor Sylvanus P. Thompson, is a history of the researches of Dr. R. Koenig, who is known not only as the constructor of the

Publications Received at Editor's Office.

BONNEY, G. E. Induction Coils. New York, Macmillan & Co. 12°. 231 p. Illustrated. $1.
COMMISSIONERS OF FISHERIES of the State of New York. Twentieth Annual Report, 1892. Albany, State Printer. 8°. 346 p.
DAY, DAVID T. Mineral Resources of the United States. Washington, Government. 8°. 679 p.
DOUGHTY, FRANCIS W. Evidences of Man in the Drift. New York. 8°. Paper. 18 p.
GRAFF, LUDWIG VON. Bibliothek des Professors der Zoologie und vergl. Anatomie. Leipzig, Wilhelm Engelnann. 8°. Paper. 353 p.
IMPERIAL UNIVERSITY OF JAPAN. Calendar for the Year 1890-91. Calendar for the Year 1891-92. Tokio, The University. 2 vols. 12°. Paper.

Reading Matter Notices.

Ripans Tabules cure hives.
Ripans Tabules cure dyspepsia.

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For information address Mr. FRITZ RUHL, President of the Societas Entomologica, Zurich-Hottingen, Switzerland.

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To exchange for books on birds or insects, or for back volumes of American Naturalist: Ecker's "Anatomy of the Frog," Packard's "Guide," Guyot's "The Earth and Man," Rockhill's, "The Land of the Lamas," Parker's "Biology," Shoemaker's "Heredity, Health and Personal Beauty," Dexter's "The Kingdoms of Nature," all new. M. J. ELROD, Ill. Wes. Univ., Bloomington, Ill.

For Sale.—About 1087 volumes of the private library of Dr. Nicolas León, formerly director of the Museum at Morelia, embracing publications of special value for Mexicologists, like those of Bishop Zumárraga (16th century), of Siguenza y Gongora, of Aleman, etc., the Missal of Spinoza, all very scarce; manuscripts on the history of Michoacán and other Mexican States, on the Tarasco (the Indian language of Michoacán) and several works, of which the only copy known to exist is in this collection. Parties interested in the sale please address DR. NIC. LEÓN, Portal de Matamoras, Morelia, Mexico.

INDEXES

TO

Volumes XVII. and XVIII

OF

SCIENCE

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The final chapters of the volume deal with "Manners and Customs of the Mohaves," by George A. Allen; "Criminal Anthropology," by Thomas Wilson; "Color Vision and Color Blindness," by R. Brudenell Carter; "Technology and Civilization," by F. Reuleaux; the "Ramsden Dividing Engine," by J. E. Watkins; "Memoir of Elias Loomis," by H. A. Newton; and a memoir of "William Kitchen Parker." The life and work of Elias Loomis form no mean portion of the wealth of Yale University, and he published 164 contributions to astronomy, meteorology, and other branches of scientific research. He was a man possessed of considerable scholarship, of positive convictions, and of a willingness to follow at all hazards wherever truth and duty, as he conceived them, might lead. Professor William Kitchen Parker was born at Dogsthorpe, near Peterborough, June 23, 1823, and died suddenly of syncope of the heart July 3, 1890. He was a fellow of the Royal, Linnean, Zoölogical, and Royal Microscopical Societies; and honorary member of King's College, London, the Philosophical Society of Cambridge, and the Medical Chirurgical Society. He was also a member of the Imperial Society of Naturalists of Moscow, and corresponding member of the Imperial Geological Institute of Vienna and the Academy of Natural Sciences of Philadelphia. In 1885 he received from the Royal College of Physicians the Bayly medal, "*Ob physiologiam feliciter excultam.*" He was "an unworldly seeker after truth, and loved by all who knew him for his uprightness, modesty, unselfishness, and generosity to fellow-workers, always helping young inquirers with specimens and information; he was suddenly lost to sight as a friend and father, but remains in the minds of fellow-workers, of those whom he so freely taught, and of his stricken relatives, as a great and good man, whose beneficent influence will ever be felt in a wide-spreading and advancing science and among thoughtful and appreciative men in all time." MARY PROCTOR.

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